CLAIMS

1. A method of optimizing external counterpulsation therapy provided to a patient with heart disease including the step of non-invasively measuring hemodynamic and pulmonary performance in terms selected from the group consisting of forward pump function or stroke volume output, retrograde effects on filling pressures, pulmonary venous flow, and gas exchange at the alveolar/capillary membrane interface or a combination thereof.

2. A method as in claim 1 wherein forward pump function of the heart is selectively derived from the oxygen pulse (VO_2/HR), and retrograde effects on filling pressures, pulmonary venous flow, and gas exchange at the alveolar/capillary membrane interface are selectively derived from the ventilatory equivalent for CO_2 (VE/VCO_2).

3. A method as in claim 2 including the step of utilizing additional cardiopulmonary variables selected from the group consisting of end tidal CO_2 ($ETCO_2$) and the ventilatory efficiency slope (linear slope of VE/VCO_2) to gauge changes in patient mortality.

4. A method as in claim 2 including the steps of displaying non-invasive cardiopulmonary exercise variables; and storing said non-invasive cardiopulmonary exercise variables as data sets, each set being associated with a unique value of cuff inflation duration (CID) and cuff inflation pressure (CIP).

5. A method as in claim 3 including the steps of displaying non-invasive cardiopulmonary exercise variables; and storing said non-invasive cardiopulmonary exercise variables as data sets, each set being associated with a unique value of cuff inflation duration (CID) and cuff inflation pressure (CIP).

6. A method as in claim 4 wherein the values for CID and CIP are defined in a boundary conditions table unique to a pacemaker manufacturer of interest.

7. A method as in claim 5 wherein the values for CID and CIP are defined in a boundary conditions table unique to a pacemaker manufacturer of interest.

8. A method as in claim 4 including the step of utilizing the stored cardiopulmonary variable sets to assist a physician in selecting the optimal

combination of CID and CIP values from several possible such values uniquely for individual patients.

9. A method as in claim 5 including the step of utilizing the stored cardiopulmonary variable sets to assist a physician in selecting the optimal combination of CID and CIP values from several possible such values uniquely for individual patients.

10. A method as in claim 8 wherein the selection process includes the following steps:

(a) executing a CID/CIP optimization protocol defining the time schedule for system operator tasks and data processing tasks for each unique value of CID and CIP as defined in claim (5);

(b) storing variable values measured for each breath during the optimization protocol as in step 7(a) into a stored data sets table for subsequent analysis;

(c) computing and storing the central tendency and the percent deviation from the central tendency for each measured variable in each set obtained immediately after collection in step 7(b) into an Intermediate table for subsequent analysis;

(d) computing and storing into a decision matrix ranking values for quantifying the response to changes in CID and CIP settings using the values obtained in step 7(c);

(e) computing and storing into a decision matrix deviation indices to provide a qualitative assessment of the variability of the data sets used to compute the ranking values obtained in step 7(d);

(f) computing and storing into a decision matrix separation indices to provide a qualitative assessment of the magnitude of the difference between the central tendencies of the data sets used to calculate the ranking values in step 7(d);

(g) selectively printing a report of the decision matrix with all values used to compute average rank, deviation, and separation in steps 7(d), 7(e), and 7(f); and

(h) selectively printing a graphical report in the form of a histogram with two bars - one bar representing the ranking values determined in step 7(d), the other bar representing the average deviation % computed from step 7(e) - and the separation indices computed in 7(f).

11. A method as in claim 9 wherein the selection process includes the following steps:

(a) executing a CID/CIP optimization protocol defining the time schedule for system operator tasks and data processing tasks for each unique value of CID and CIP as defined in claim (5);

(b) storing variable values measured for each breath during the optimization protocol as in step 7(a) into a stored data sets table for subsequent analysis;

(c) computing and storing the central tendency and the percent deviation from the central tendency for each measured variable in each set obtained immediately after collection in step 7(b) into an Intermediate table for subsequent analysis;

(d) computing and storing into a decision matrix ranking values for quantifying the response to changes in CID and CIP settings using the values obtained in step 7(c);

(e) computing and storing into a decision matrix deviation indices to provide a qualitative assessment of the variability of the data sets used to compute the ranking values obtained in step 7(d);

(f) computing and storing into a decision matrix separation indices to provide a qualitative assessment of the magnitude of the difference between the central tendencies of the data sets used to calculate the ranking values in step 7(d);

(g) selectively printing a report of the decision matrix with all values used to compute average rank, deviation, and separation in steps 7(d), 7(e), and 7(f); and

(h) selectively printing a graphical report in the form of a histogram with two bars - one bar representing the ranking values determined in step

7(d), the other bar representing the average deviation % computed from step 7(e) - and the separation indices computed in 7(f).

12. A method as in claim 10 wherein the variables computed in steps (a) to (f) are represented in common graphical formats selected from the group consisting of lines, bars, and pie charts.

13. A method as in claim 11 wherein the variables computed in steps (a) to (f) are represented in common graphical formats selected from the group consisting of lines, bars, pie charts.

14. A method as in claim 10 wherein one of the variables utilized is a patient mortality predictor.

15. A method as in claim 11 wherein one of the variables utilized is a patient mortality predictor.

16. A method as in claim 10 wherein the variables are measured under steady-state conditions and are treated as dependent variables for assessments, and independent variables are cuff inflation duration and cuff inflation pressure.

17. A method as in claim 11 wherein the variables are measured under steady-state conditions and are treated as dependent variables for assessments, and independent variables are cuff inflation duration and cuff inflation pressure.

18. A method wherein a common set of equipment is utilized to optimize all phases of external counter pulsation therapy, including device programming and assessment of patient risk.

19. A method as in claim 10 wherein decisions can be made from selected quantitative and qualitative information.

20. A method as in claim 11 wherein decisions can be made from selected quantitative and qualitative information.